

REMARKS/ARGUMENTS

Reconsideration and allowance in view of the foregoing amendment and the following remarks are respectfully requested.

Previously added claim 13 has been incorporated in amended claim 1 and claim 13 has been canceled.

Claims 1-6 are now pending.

Claims 1,2,4-6,13 were rejected under 35 USC 103(a) as being unpatentable over Mase et al (USP 4,798,693) in view of Radford et al (USP 3,843,400) or Kobayashi et al (USP 4,961,835). Applicant respectfully traverses this rejection.

The multilayered gas sensing element of this invention includes a crystal phase containing silicon dioxide included in the bonding boundary between a solid electrolytic sheet containing zirconia and yttria and an insulating sheet containing alumina. In this regard, the invention is directed to enhancing the bonding strength at the bonding boundary between the solid electrolytic sheet and the insulating sheet.

None of the cited references teach or suggest a crystal phase containing silicon dioxide included in the bonding boundary between a solid electrolytic sheet containing zirconia and yttria and an insulating sheet containing alumina.

The Examiner states that Mase discloses a zirconia sheet. However Mase fails to disclose a solid electrolytic sheet containing zirconia and yttria.

The Examiner states that Radford discloses adding 0.5 to 2 mol% of silica to a zirconia solid electrolyte. However, Radford fails to disclose adding 0.5 to 2 mol% of silica to a solid electrolytic sheet containing zirconia and yttria. Radford only discloses adding 0.5 to 2 mol% of silica to a zirconia solid electrolyte when the stabilizer is CaO (col.3, line 15-16). On the other hand, Radford discloses adding MgO or Fe₂O₃ to a zirconia solid electrolyte when the stabilizer is yttria (col.3, line 17-20). Therefore, without the benefit of applicant's disclosure, it would not have been obvious from

Radford to one possessing ordinary skill in the art to add silica to a solid electrolytic sheet containing zirconia and yttria.

The Examiner states Kobayashi discloses adding silica to a zirconia solid electrolyte. While this may be true, since Kobayashi discloses a solid electrolytic body adhered to an alumina pipe (column 4, lines 1-2), it is clear that in Kobayashi a crystal phase containing silicon dioxide does not exist between the solid electrolytic body and the alumina pipe. It is also clear, as noted above, that a crystal phase containing silicon dioxide does not exist in the Mase device. Thus, neither Kobayashi nor Mase discloses a crystal phase containing silicon dioxide included in a bonding boundary between a solid electrolytic sheet containing zirconia and yttria and an insulating sheet containing alumina. Moreover, there is no suggestion in the cited art concerning this claimed characteristic feature of the invention. For this reason, it would not have been obvious to combine the cited art and one possessing ordinary skill in the art would not have found it obvious to provide for a crystal phase containing silicon dioxide between a solid electrolytic sheet and an insulating sheet. Therefore, the Examiner's rejection of the noted claims can only be based on hindsight.

Claim 3 was rejected under 35 U.S.C 103(a) as being unpatentable over Mase in view of Radford or Kobayashi and in further view of Ishiguro et al (USP 4,851,105). Applicant respectfully traverses this rejection.

Claim 3 is submitted to be patentable over the applied art for the reasons advanced above. The Examiner's further reliance on Ishiguro does not overcome the deficiencies of the primary references noted above. In this regard, Ishiguro does not teach or in anyway suggest a bonding boundary including a crystal phase containing silicon dioxide between a solid electrolytic sheet containing zirconia and yttria and an insulating sheet containing alumina in the combination specifically claimed by applicant. It is therefore respectfully submitted that these claims are allowable over the prior art as well.

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Claim 5 was rejected under 35 U.S.C 103(a) as being unpatentable over Mase in view of Radford or Kobayashi and in further view of JP9-26409. Applicant respectfully traverses this rejection.

Claim 5 is submitted to be patentable over the applied art for the reasons advanced above. The Examiner's further reliance on JP9-26409 does not overcome the deficiencies of the primary references noted above. In this regard, JP9-26409 does not teach or in anyway suggest a crystal phase containing silicon dioxide included in a bonding boundary between a solid electrolytic sheet containing zirconia and yttria and an insulating sheet containing alumina in the combination specifically claimed by applicant. It is therefore respectfully submitted that these claims are allowable over the prior art as well.

Claim 6 was rejected under 35 U.S.C 103(a) as being unpatentable over Mase in view of Radford or Kobayashi and in further view of JP08-114571. Applicant respectfully traverses this rejection.

Claim 6 is submitted to be patentable over the applied art for the reasons advanced above. The Examiner's further reliance on JP08-114571 does not overcome the deficiencies of the primary references noted above. In this regard, JP08-114571 does not teach or in anyway suggest that a crystal phase containing silicon dioxide included in a bonding boundary between a solid electrolytic sheet containing zirconia and yttria and an insulating sheet containing alumina in the combination specifically claimed by applicant. It is therefore respectfully submitted that these claims are allowable over the prior art as well.

Claims 1, 4-6, and 13 were rejected under 35 USC 103(a) as being unpatentable over Mase in view of Hayakawa et al (USP 5,122,487). Applicant respectfully traverses this rejection.

The multilayered gas sensing element of this invention includes a crystal phase containing silicon dioxide included at least partly in a bonding boundary between a solid

electrolytic sheet containing zirconia and yttria and an insulating sheet containing alumina.

As noted above, none of the cited references teach or suggest a crystal phase containing silicon dioxide included in a bonding boundary intervening between a solid electrolytic sheet containing zirconia and yttria and an insulating sheet containing alumina.

The Examiner states Mase discloses a device with a zirconia layer laminated to an alumina layer by sintering. However Mase fails to disclose a solid electrolytic sheet containing zirconia and yttria.

The Examiner further states that Hayakawa discloses a zirconia solid electrolyte containing up to 0.2% silica as an impurity. The Examiner then summarily concludes that it would have been obvious for Mase to adopt the zirconia electrolyte of Hayakawa as its zirconia solid electrolyte, because of its good mechanical properties and high withstand voltage. However, Hayakawa fails to disclose adding silica to a zirconia solid electrolyte. In this regard, Hayakawa refers to "unwanted SiO₂" in line 12 of the abstract. For this reason, one possessing ordinary skill in the art would not think to select a zirconia solid electrolyte containing silica, much less add silica to a zirconia solid electrolyte, but rather would avoid a zirconia solid electrolyte containing silica. Therefore, it would not have been obvious for Mase to adopt the zirconia electrolyte of Hayakawa as his zirconia solid electrolyte. In any event, this combination would not provide a solid electrolytic sheet containing zirconia and yttria.

Claim 2 was rejected under 35 U.S.C 103(a) as being unpatentable over Mase in view of Hayakawa and in further view of Radford. Applicant respectfully traverses this rejection.

Claim 2 is submitted to be patentable over the applied art for the reasons advanced above. The Examiner's further reliance on Radford does not overcome the deficiencies of the primary references noted above. In this regard, Radford does not teach or in anyway suggest a crystal phase containing silicon dioxide in a bonding

boundary between a solid electrolytic sheet containing zirconia and yttria and an insulating sheet containing alumina in the combination claimed by applicant. It is therefore respectfully submitted that these claims are allowable over the prior art as well.

Claim 3 was rejected under 35 U.S.C 103(a) as being unpatentable over Mase in view of Hayakawa and in further view of Ishiguro. Applicant respectfully traverses this rejection.

Claim 3 is submitted to be patentable over the applied art for the reasons advanced above. The Examiner's further reliance on Ishiguro does not overcome the deficiencies of the primary references noted above. In this regard, Ishiguro does not teach or in anyway suggest a crystal phase containing silicon dioxide in a bonding boundary intervening a solid electrolytic sheet containing zirconia and yttria and an insulating sheet containing alumina in the combination specifically claimed by applicant. It is therefore respectfully submitted that these claims are allowable over the prior art as well.

Claim 5 was rejected under 35 U.S.C 103(a) as being unpatentable over Mase in view of Hayakawa or Kobayashi and in further view of JP9-26409. Applicant respectfully traverses this rejection.

Claim 5 is submitted to be patentable over the applied art for the reasons advanced above. The Examiner's further reliance on JP9-26409 does not overcome the deficiencies of the primary references noted above. In this regard, JP9-26409 does not teach or in anyway suggest a crystal phase containing silicon dioxide in a bonding boundary between a solid electrolytic sheet containing zirconia and yttria and an insulating sheet containing alumina in the combination specifically claimed by applicant. It is therefore respectfully submitted that these claims are allowable over the prior art as well.

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Claim 6 was rejected under 35 U.S.C 103(a) as being unpatentable over Mase in view of Hayakawa or Kobayashi and in further view of JP08-114571. Applicant respectfully traverses this rejection.

Claim 6 is submitted to be patentable over the applied art for the reasons advanced above. The Examiner's further reliance on JP08-114571 does not overcome the deficiencies of the primary references noted above. In this regard, JP08-114571 does not teach or in anyway suggest a crystal phase containing silicon dioxide in a bonding boundary between a solid electrolytic sheet containing zirconia and yttria and an insulating sheet containing alumina as specifically claimed by applicant. It is therefore respectfully submitted that these claims are allowable over the prior art as well.

All objections and rejections having been addressed, it is respectfully submitted that the present application is in condition for allowance and an early Notice to that effect is earnestly solicited.

Respectfully submitted,

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